Dielectric RF Cavities

Addressing the challenges of a Muon collider

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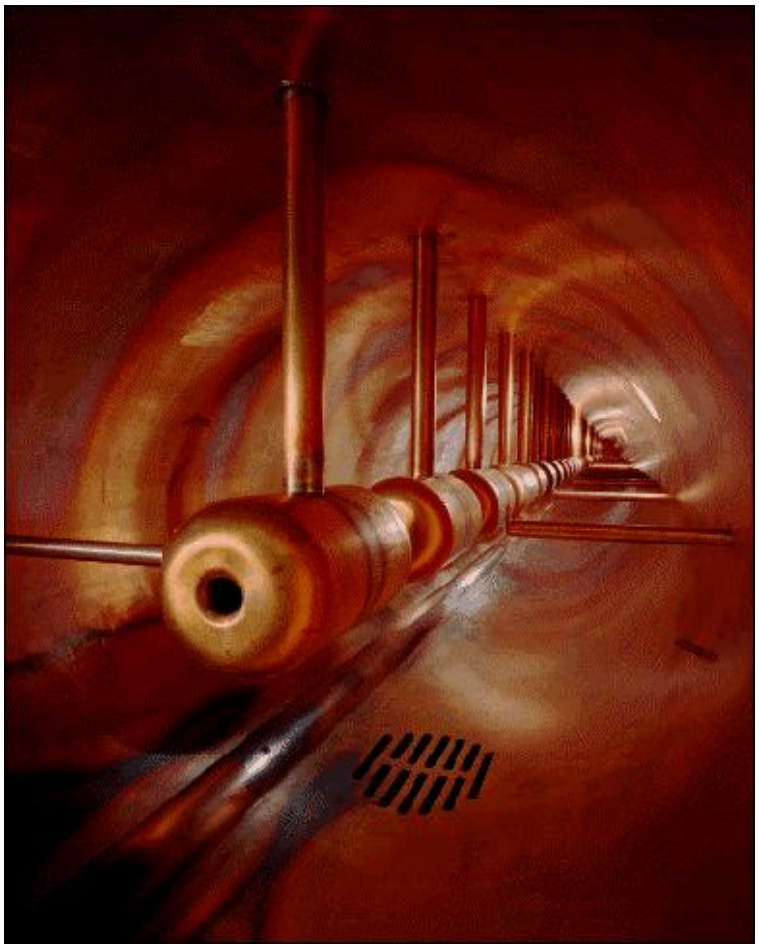
RF Cavities



Fermilab linac. Image source: www-bd.fnal.gov

- Radio frequency power used to accelerate charged particles
- Frequency depends on geometry of cavity and the properties of the material within cavity
- For a basic pillbox cavity: $f = \frac{2.405c}{2\pi R\sqrt{\epsilon\mu}}$

Constraints for Muon acceleration

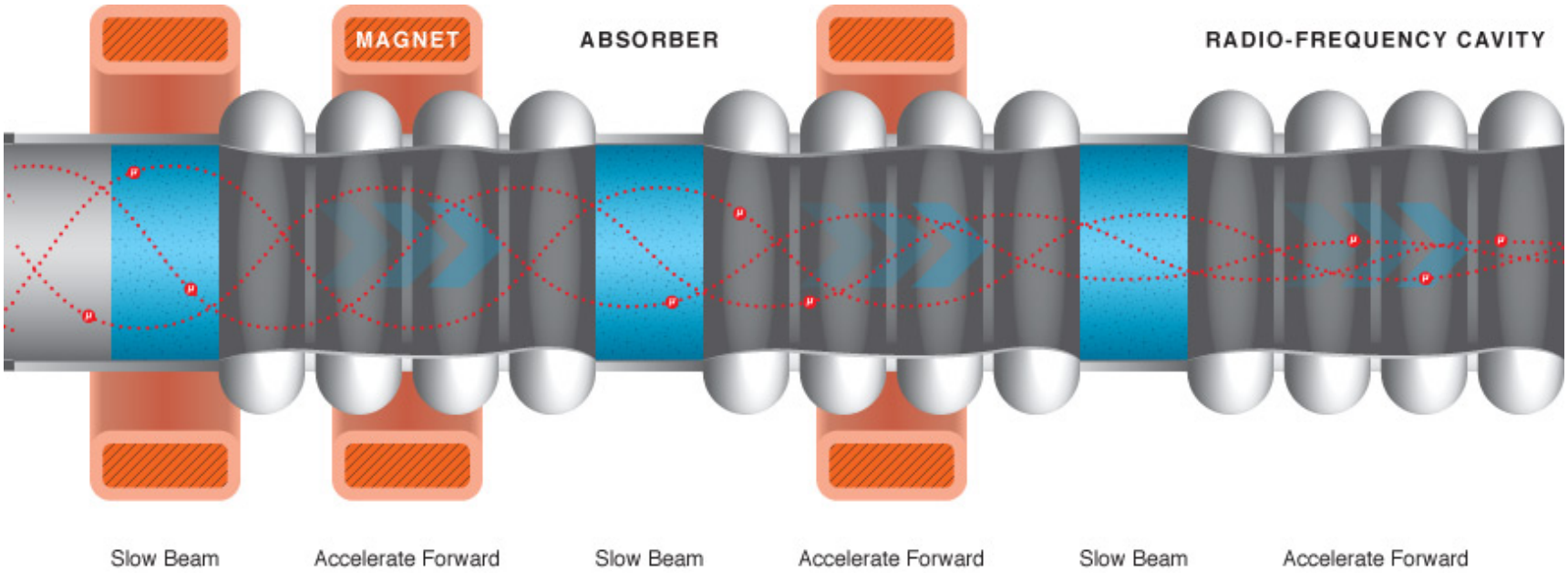


Image source: fnal.gov

Muon Acceleration

- Muons have a short lifetime
- Ionization cooling slows momentum in all directions
- RF power is used to accelerate longitudinally

Constraints on accelerating RF cavities

- Must fit inside solenoids
- Use existing RF power supply
- Prevent breakdown

Simulations

Using dielectrics to reduce frequency of cavities